Professor Schröder discusses those two methods of logic which are known by the names: the Logic of Intension and the Logic of Extension. (*Logik des Inhaltes*, and *Logik des Umfangs*.) This leads to a discussion of definition, the categories, and conceptual writing which would find its ideal in a system of pasigraphy, or universal language, for the perfection of which an algebra of logic would be indispensable.

The symbols employed by Schröder are borrowed to a great extent from Peirce, but they are considerably improved and it is probable that Schröder's innovations will be universally accepted.

We purposely refrain here from discussing the particulars of Schröder's work, stating only in a general way that his proposition of a new symbol for subsumption, (he proposes to replace the old symbol $-<$ by $\overset{\frown}{=}$ to signify "equal to or subsumed under"), his treatment of the symbols o and 1, the former representing an absence of certain marks, or as it has been called their "incompossibility," as being excluded by the presence of other marks; the other the universe of the whole subject under discussion, and all the other problems which he separately treats in his lectures are admirably presented and command almost throughout the reader's consent. We now conclude our review with the quotation of the last paragraph of Schröder's introduction on p. 125. Having declared that "logical inquiry should not be judged from the short-sighted or narrow-minded, not to say *borné*, utilitarian standpoint," he points out the great practical importance of his science, saying:

"Similarly, as with other sciences, so logic also may be expected to realise and "produce undreamed of results, which may incidentally bring about, in a most sur- "prising way, incalculable advantages. Let me only point out one thing. Since "the impulse which this science has of late received, there have been already con- "structed three logical machines which although we grant, scarcely deserve their "name, because their efficacy remains still very rudimentary, may be compared to "Papin's pot that in a more advanced state became the steam-engine. Indeed, "nobody can presage whether after all a thinking machine might not be constructed, "which would be analogous to, but more perfect than the calculating machines. "The latter have relieved man of a considerable portion of much fatiguing thought- "work, just as the steam-engine has been successful in relieving him from physical "labor."

"To be sure we must not expect to reap while we are still sowing, and least so "in such a case as this where the harvest is to be expected from trees." κρς.

THE GRAMMAR OF SCIENCE. By *Karl Pearson*, M. A. With 25 figures in the text. London: Walter Scott, 24 Warwick Lane. Imported by Charles Scribner's Sons, New York.

We are greatly in sympathy with the methods and principles of Professor Karl Pearson's "Grammar of Science." The work is a comparatively popular and also brief exposition of the modern ideal of scientific inquiry. "The goal of

"science is clear—it is nothing short of the complete interpretation of the universe. "But that goal," adds the author, "is an ideal one—it marks the *direction* in "which we move and strive."

The best part of the book is in our opinion the introductory chapter which sets forth "the scope and method of science" and shows the need of a "Grammar of Science." Says the author in the summary of this chapter:

"The scope of science is to ascertain truth in every possible branch of knowl- "edge. There is no sphere of inquiry which lies outside the legitimate field of "science. To draw a distinction between the scientific and philosophical methods "is obscurantism."

The present generation is in a state of fermentation. While one man finds a restlessness, a distrust of all authority, a questioning of the basis of all social institutions and long established methods, another pictures for us a golden age in the near future. One teacher propounds what is flatly contradicted by a second. We require some guide in the determination of our actions, and not for our own private but also our public duties. "Every citizen is thrust into an appalling maze of so- "cial and educational problems; and if his tribal conscience has any stuff in it, he "feels that these problems ought not to be settled, so far as he has the power of "settling them, by his own personal interests, by his individual prospects of profit "or loss. He is called upon to form a judgment apart from his own feelings and "emotions if it possibly may be—a judgment in what he conceives to be the inter- "ests of society at large."

"How is such a judgment to be formed?" The answer is by science. Such a judgment can only be based on a clear knowledge of facts, on an appreciation of their sequence and relative significance. The judgment based upon them ought to be independent of the individual mind which examines them, and this frame of mind which is that of the scientist is an essential of good citizenship. Not as if the scientist were *eo ipso* a good citizen, but society has an interest in the propagation of the methods of modern science. Sound citizenship will be promoted by training the mind to an exact and impartial analysis of facts.

How much a grammar of science is needed can be learned from the confusion that prevails concerning the fundamental concepts of science. Says Pearson:

"Anything more hopelessly *illogical* than the statements with regard to force "and matter current in elementary text-books of science, it is difficult to imagine; "and the author, as a result of some ten years' teaching and examining, has been "forced to the conclusion that these works possess little, if any, *educational* value; "they do not encourage the growth of *logical* clearness or form any exercise in sci- "entific method."

"The views expressed in this *Grammar* on the fundamental concepts of sci- "ence, especially on those of force and matter, have formed part of the author's "teaching since he was first called upon to think how the elements of dynamical "science could be presented free from *metaphysics* to young students."

Professor Pearson calls attention to the danger that arises from two modes of thought, viz. that of the metaphysician and that of the agnostic. He says:

"The poet is a valued member of the community, for he is known to be a "poet; his value will increase as he grows to recognise the deeper insight into na- "ture with which modern science provides him. The metaphysician is a poet, "often a very great one, but fortunately he is not known to be a poet, because he "clothes his poetry in the language of apparent reason, and hence it follows that "he is liable to be a dangerous member of the community. The danger at the "present time that metaphysical dogmas may check scientific research is, perhaps, "not very great."

Fortunately the danger that arises from metaphysicism is past. "For," adds Pearson, "The day has gone by when the Hegelian philosophy threatened to "strangle infant science in Germany;—that it begins to languish at Oxford is a "proof that it is practically dead in the country of its birth. The day has gone by "when philosophical or theological dogmas of any kind can throw back, even for "generations, the progress of scientific investigation."

The scientist will, it is true, often have to confess: "There I am ignorant." But it would be absurd to restrict science to the limited field of thought which it occupies to-day. Professor Pearson continues:

"It is true that this view is not held by several leading scientists, both in this "country and Germany. They are not content with saying, 'We *are* ignorant,' but "they add, with regard to certain classes of facts, 'Mankind must *always* be ig- "norant.' Thus in England Professor Huxley has invented the term *Agnostic*, not "so much for those who are ignorant as for those who limit the possibility of "knowledge in certain fields. In Germany Professor E. du Bois-Reymond has "raised the cry: '*Ignorabimus*'—'We shall be ignorant,' and both his brother and "he have undertaken the difficult task of demonstrating that with regard to certain "problems human knowledge is impossible. We must, however, note that in these "cases we are not concerned with the limitation of the scientific method, but with "the denial of the possibility that any method whatever can lead to knowledge. "Now I venture to think that there is great danger in this cry: 'We *shall* be ig- "norant.' To cry 'We are ignorant,' is safe and healthy, but the attempt to dem- "onstrate an endless futurity of ignorance appears a modesty which approaches "despair. Conscious of the past great achievements and the present restless ac- "tivity of science, may we not do better to accept as our watchword that of Gal- "ilei: 'Who is willing to set limits to the human intellect?'—interpreting it by "what evolution has taught us of the continual growth of man's intellectual powers."

The introductory chapter presents the general plan of Professor Pearson's book. The following chapters contain the detailed work of the plan. The head- ings of these chapters are: II, The Facts of Science; III, The Scientific Law; IV, Cause and Effect—Probability; V, Space and Time; VI, The Geometry of Motion;

VII, Matter; VIII, The Laws of Motion; IX, Life; X, The Classification of the Sciences.

Professor Pearson follows Professor Ernst Mach in his expositions (especially in Chap. II) very closely, and especially refers to the latter's contributions to *The Monist*. Pearson emphasises with Mach the distinction between the conceptual and perceptual, between ideas or noumena and sensations. He rejects, as does Professor Mach, the assumption of unknowables beyond our groups of sense-impressions, saying: "It is idle to postulate shadowy unknowables behind that real "world of sense-impression in which we live" (p. 88), and yet he says in another passage on p. 134: "There is mystery enough in the chaos of sensations and in its "capacity for containing those little corners of consciousness which project their "own products, of order and law and reason, *into an unknown and unknowable* "*world.*"

It appears to us that the deeper reason of this apparent inconsistency can be traced to the author's conception of the import of knowledge. He follows Kirchhoff in the acceptance of the theory that scientific law is a brief description of facts in mental shorthand. But at the same time he follows Clifford and Mach too closely; the former in the respect that we can know the "how" only and not the "why," and the latter in overlooking the fact that concepts are symbols which stand for something and have a meaning. Pearson says on p. 145, "Science describes how they [motions] take place, but the *why* remains a mystery." But should we not, we ask, rather supplant the old and metaphysical conception of the "why" (the sense of it as here implied) by a better and more correct conception? The metaphysical "why" is not so much a mystery as it is the incorporation of an illegitimate problem. The "why" of positive science demands as answer an exhaustive description of those conditions which as the outcome of a definite transformation inevitably produce a certain phenomenon.

But here we must criticise Professor Pearson's view of "description," as well also as his view of causation. Cause and effect are to him, as they were to Mill, mere sequences; necessity belongs exclusively to the conceptual realm, and is "illogically transferred to the world of perceptions."

An exhaustive description will trace the process of causation, and whenever we succeed in this we have answered the question "why" in the only sensible meaning it possesses. Sense-impressions do *not*, as Professor Pearson expresses it, "shut us in," so that the beyond remains a mystery to us. Sense-impressions represent the beyond of reality and they represent it in such a way as to enable us to deal with it properly. This representation is knowledge and thus the world is *not* unknowable. The world is full of mystery, but knowledge itself is not mysterious. Having sense-impressions and interpreting them in our conceptual inferences we know something of the world.

We are not prepared to accept Professor Pearson's views that "change is perceptual, motion conceptual," and also that "we are not compelled to postulate a

space outside of self for phenomena" (p. 196). We should say that our concepts, the concepts motion and space included, represent certain features of reality. We might give a special name to those features of reality which are represented by the terms motion and space, but we could not deny their objective reality without at the same time denying the validity of the concepts.

Says Professor Pearson, "All things move—but only in conception" (p. 385). "What moves in conception is a geometrical ideal, and it moves because we conceive it to move." These propositions have no meaning if pronounced from our standpoint. Observe also that Professor Pearson inculcates the conceptuality of motion by unnecessarily repeating the word in the formula on page 341 which begins as follows: "Every corpuscle in the *conceptual* model of the universe must be *conceived* as moving. . . ." When we conceive something as moving we mean that not only in the conceptual model, but also in reality there is an action taking place which we represent by the concept motion. To say that we have knowledge only of changes but that we do not know whether those changes which we describe as mechanical are really motions, appears to us idle subtlety. The point is whether this method of describing those events enables us to deal with them properly. If it does it answers the purpose.

In spite of all our disagreements we feel ourselves in close contact with the author of "The Grammar of Science," for we agree with respect to the principles of science and we certainly can leave the settlement of our differences to a common test on the basis of these principles. Moreover, the attitude of the author seems to us very much like that which we take ourselves. We quote from a former publication of his, the following passage *:

"I set out from the standpoint that the mission of Freethought is no longer to "batter down old faiths; that has been long ago effectively accomplished, and I, "for one, am ready to put a railing round the ruins, that they may be preserved "from desecration and serve as a landmark. Indeed I confess to have yawned over "a recent vigorous inditement of Christianity, and I promptly disposed of my copy "to a young gentleman who was anxious that I should read a work entitled: *Nat-*"*ural Law in the Spiritual World*, which he told me had given quite a new width "to the faith of his childhood." κρς.

PHILOSOPHIE DER ARITHMETIK. Psychologische und logische Untersuchungen. By Dr. *E. G. Husserl*. Erster Band. Halle-Saale: C. E. M. Pfeffer. 1891.

The present volume does not pretend to be a complete system of the philosophy of arithmetic, but it attempts to prepare, in a series of psychological and logical investigations, the scientific foundation for a future construction of this disci-

* The book from which we quote, namely *The Ethic of Freethought*, like the book here under discussion, contains much detail matter in which we differ most emphatically from the author; (he is, for instance, in our opinion very unjust to Martin Luther;) but it seems to us that he pursues an aim that we have in common with him.